REMARKS/ARGUMENTS

Paragraph 0012 is amended to correct a typographical error. That 1.5 should have been 15 is obvious from the context.

The invention resides in the use of an particular sintered alloy as the composition of a pawl in a ratchet type timing chain tensioner for a direct injection gasoline or diesel engine. As explained in paragraphs 0006 and 0007 of the applicants' specification, in such an engine, the pawl of the tensioner is subjected to a very adverse environment. Significant amounts of carbon soot are generated as a result of partial burning of the engine's fuel, and particles enter the gaps between the pawl and the plunger rack of the tensioner, forming inclusions that cause abrasive wear. In addition, when the engine oil is not changed with sufficient frequency, carbon soot, as well as particles of metal resulting from engine wear, enter the oil and also cause wear of the pawl. In short, the problem with the use of a sintered tensioner pawl in a direct injection gasoline engine or a diesel engine is that the pawl will wear too quickly.

Prior to the applicants' invention, the only known solution was to use a more expensive, non-sintered, pawl made from a hard alloy steel such as chromium steel or chromium-molybdenum steel.

Claim 1 has been amended to specify that the ratchet tensioner having the particular pawl composition is in the valve timing transmission of a direct injection gasoline or diesel engine, and that the tensioner is arranged to maintain tension in the timing chain. Thus, the particular type of engine is positively recited as an element of the claim. In

addition, the word "indispensable," which appears in paragraphs 0023 and 0026, has been introduced to qualify the word "impurities."

The applicants do not dispute the rejection insofar as it combines Suzuki and JP 55-40349. It was admittedly obvious to use a sintered pawl in a ratchet-type timing chain tensioner. However, there are reasons why the teachings of Takahasi do not demonstrate that the invention, as claimed, would have been obvious.

First, Takahasi mentions the use of a sintered material for engine parts such as valves and valve seats, piston rings, and exhaust collars, but does not suggest a sintered material for use in the pawl of a ratchet tensioner.

More importantly, as mentioned above, the main problem with the use of a sintered pawl in a direct injection engine is that a sintered pawl wears out quickly. Takahasi discloses a sinterable powder containing 2 to 15% cobalt and 2 to 10% molybdenum, the balance being iron and inevitable impurities. This powder has essentially the same composition as the applicant's pawl, the only difference being a small difference in the lower limit of the amount of cobalt (2% vs. 5%). The Takahasi composition, however, is expressly described as having "superb compressibility and corrosion resistance." (Takahasi, column 3, lines 46-53.)

Takahasi also implies that the alloying elements, cobalt and molybdenum, when uniformly dissolved in the iron-based matrix, have a favorable effect on wear resistance of the sintered alloy. (Takahasi, column 6, lines 1-5). However, from a reading of Takahasi as a whole, it appears that, when Takahasi wants wear resistance, he does either or both of two things: he adds graphite, or he adds "hard particles."

The addition of graphite to improve wear resistance is described by Takahasi at column 3, lines 54-65. With graphite added, Takahasi's composition would be different from the pawl composition defined in the applicants' amended claim 1. That is, it would contain graphite powder mixed in an amount of 0.20 to 2.1% by weight. It would not be "*composed* of a sintered alloy having a density of at least 6.8 g/cm^3 and containing 5 to 15 wt% Co, a total of 2.0 to 10 wt% of at least one metal from the group consisting of Ni, Cr and Mo, and the *balance* Fe and *indispensable* impurities." (Italics are added to show the language that effectively excludes anything more than trace amounts of graphite.)

Takahasi describes the addition of hard particles for enhancing corrosion resistance and oxidation resistance. (column 4, lines 7-9. And, at column 6, lines 45-51, Takahasi hints that wear resistance can also be improved by the addition of the hard particles. The hard particles, however, are composed of (a) iron, molybdenum and carbon, (b) iron chromium and carbon, or (c) iron, tungsten and carbon. Here again, the additions would result in a composition different from that defined in the applicants' claim.

In summary, it would be difficult for the person of ordinary skill to derive from Takahasi a suggestion of using the applicants' claimed sintered composition in the pawl of a tensioner for a direct injection gasoline engine or diesel engine. The person having ordinary skill, seeking to improve a sintered tensioner pawl for such an engine, would be primarily concerned with improving wear resistance. What that person would take from Takahasi's teachings is that, if wear resistance is a major concern, graphite, or hard particles in

at least one of the three categories (Fe-Mo-C, Fe-Cr-C or Fe-W-C) should be used in the Iron-Cobalt-Molybdenum sintered alloy. The person of ordinary skill, therefore, would not be led to the applicants' solution by the teachings of Takahasi.

The applicants therefore request favorable reconsideration and allowance of their application.

Respectfully submitted,
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